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ABSTRACT

The purpose of this paper is to review problems encountered in World Wide Web-based courses delivered at three different educational institutions (i.e., two community colleges and a university) in the metropolitan Phoenix (Arizona) area. Implications are discussed based on distance education theories of interaction. Interaction is a vital issue to the design of online courses. Further inquiry that sheds light on online students' motivational characteristics and organizational skills is vital in order to empower educators to design instructionally sound courses and students to benefit from them. Results would also aid academic administrators to predict student success with the ultimate possible purpose of lowering attrition rates. Lessons learned are discussed in two areas: technological aspects of online education; and instructional design and course development principles for online courses. (Contains 30 references.) (Author/MES)

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Problems and Practical Solutions of Web-Based Courses: Lessons Learned from Three Educational Institutions

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Abstract: The purpose of this paper is to review problems encountered in web-based courses delivered at three different educational institutions. Implications are discussed based on distance education theories of interaction. Interaction is a vital issue to the design of online courses. Further inquiry that sheds light on online students' motivational characteristics and organizational skills is vital in order to empower educators to design instructionally sound courses and students to benefit from them. Results would also aid academic administrators to predict student success with the ultimate possible purpose of lowering attrition rates.

Introduction

Historically, distance education has been defined as the delivery of instruction in which time and geographic location separate students and teachers (McIsaac & Gunawardena, 1996; Moore, 1988). Distance education courses have been an alternative for students in remote areas, or with difficult time schedules, job demands, or family responsibilities, unable to participate in traditional classroom instruction. The lack of face-to-face meetings between teachers and students in a shared classroom has led to the development of systems of delivering instruction in modalities often very different from those used in traditional teaching. Over the years different delivery systems have evolved along with the development of communication technology. In the late 1800s, traditional mail played the role of the first delivery system in correspondence studies. During the next one hundred years, radio, television, and computer multimedia were used to deliver instruction. The development of advanced technologies in the last decade has had an important impact on education. As a result, computer networks and the Internet are becoming the leading way to reach online learners and proving to be a global communication system (Harasim, 1996).

The present trend and market demand for education is indeed toward online education. This trend is highlighted in the "*The Condition of Education*" report published by the National Center for Education Statistics (NCES, 1999). According to this report, in 1995 thirty-three percent of higher education institutions offered distance education courses and another twenty-five percent indicated plans to begin courses within three years. Furthermore, Peterson's (1999) Distance Learning Guide provides information about two thousand degree and certificate programs available from nearly 900 institutions. This number can be compared to 762 institutions in 1997 and 93 institutions in 1993. Many educational institutions offer a wide variety of online courses and provide the opportunity for students to enroll in certain online courses as part of a degree. Other institutions offer complete undergraduate and graduate degrees through online distance education. Finally, the Kellogg Commission on the Future of State and Land-Grand Universities (1999) recently published a report entitled "*Returning to Our Roots: A Learning Society.*" Members of the commission included presidents of state institutions that have invested heavily in technology in recent years through statewide distance education programs. According to the report, online technology needed for universal access to education is available today.

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The Three Educational Institutions

Three institutions in the metropolitan Phoenix area offer Internet courses in a wide disciplinary spectrum. The first institution is a community college that offers traditional as well as distance learning courses. The "school without walls" is one of the leading institutions in the race for online distance education and offers more than 200 courses on the World Wide Web. Online students use the FirstClass conferencing system for fulfilling course requirements and promoting interaction in the virtual environment. The Distance Learning department provides technical support to students on a twenty-four hour, seven days a week basis. Attrition rates in online courses range between twenty and forty percent at this institution.

The second institution is the second largest traditional community college in the United States. The Center for Teaching and Learning department offers about 110 Internet courses, but provides very little technical support to students who face hardware or software problems. Attrition rates in online courses were up to seventy percent at this institution.

The third institution is an urban university that offers about seventy online courses. Students use the CourseInfo conferencing system for synchronous and asynchronous interaction and to fulfill course requirements. The Distance Learning Technology department provides some technical support to students by phone or email. Attrition rates at this institution range between forty and fifty percent.

While the three institutions possess extensive hardware and software resources, attrition rates are very high. Attrition rates in distance education courses tend to be forty to fifty percent higher than the ones in traditional face-to-face classrooms (Dille & Mezack, 1991; Parker, 1994). Distance education requires students to monitor and regulate their own learning because of the geographic separation between students and instructors. One of the main factors that influence attrition rates is the concept of interaction.

Distance Education and Interaction

The use of communications technology is still a recent development in education and many online students (as well as instructors) encounter various difficulties and feel frustrated with using such technologies. Examples include students who are technologically illiterate and therefore are not able to interact with their classmates or the instructor, download instructional material from the class web site, or submit online assignments and participate in discussions.

Interaction in an online environment is one of the most important factors that influence the success or failure of a program. Keegan (1988) views interaction as a key to effective learning and information exchange, and Moore (1989) considers interaction as "vitally important" in the design of distance education (p. 6). Furthermore, Kearsley (1995) points out that a high level of interaction positively influences the effectiveness of any distance learning course.

There are four types of online interaction identified in the literature. Moore (1989) identified learner-content, learner-instructor, and learner-learner interaction. Hillman, Willis, and Gunawardena (1994) identified a fourth type of interaction, namely learner-interface interaction.

Moore (1989) defines learner-content interaction as the intellectual interaction between the learner and the topic of study. According to Moore, learner-content interaction is an important concept of online environments because it changes learners' behavior toward an educational goal. The importance of this type of interaction is also depicted by Moore and Kearsley (1996) in the statement: "it is not too difficult to present information over a distance, but getting people to participate and making learning active at a distance is much harder" (p. 133).

The second type of interaction in online environments occurs between learners and instructors or team of subject-experts who prepared the course material. In this type of interaction, instructors are responsible for stimulating and continuously maintaining learners' interest in the topic, motivating students to learn, assessing students' progress, and finally providing support and encouragement to them (Moore, 1989).

The third type of interaction occurs among the learners of an online environment with or without the real-time presence of instructors. This type of interaction represents the communication between one learner with another learner, or with a group of learners, and takes place either synchronously, via "live" discussion chats, or asynchronously, via the exchange of electronic email or posting of messages in bulletin boards.

Hillman et al. (1994) define learner-interface interaction as "a process of manipulating tools to accomplish a task" (p. 34). Learners must understand not only the procedures for working with the interface, but also the reasons why these procedures obtain results. This fourth type of interaction links the other three types of interaction together.

Learners must be able to use online technologies in order to interact and communicate with instructors, peers, and the course content. The absence of interaction can inhibit student success and may even force online students to drop out of online courses.

Enhancements of the four types of interaction in an online environment are the lessons learned from our experiences with the three educational institutions.

Lessons Learned

Based on our experiences with the three educational institutions, we classified the findings in two categories. The first category pertains to technological aspects of online education, while the second category includes instructional design and course development principles for online courses. Both categories target lowering the high attrition rates encountered in online courses.

Technological Aspects of Online Education

Students enrolled in web-based courses are often required to use technology for the daily procedures of the course. Such procedures include (a) email interaction with peers and instructors, (b) using a web browser to access class material, (c) searching for journal articles using the Internet, online databases, and the institution's libraries, (d) submitting assignments online, and (e) participating in weekly discussions. These are examples of the four online types of interaction identified before. Moore (1989) suggests that online students need to interact with the instructor, the course content, and their peers. The only way for any interaction to take place is for students to use CMC systems. Interaction is vital to distance educators because if one type of interaction is missing, or it is not well thought and planned, then online courses might not be effective and successful. For example, if there is no interaction between learners and the topic being studied (because of unspecified or unclear instructions, assignment questions, or discussion topics), then learners will not obtain the desired learning outcomes. Moreover, if learners cannot communicate with instructors in order for the latter to answer any questions or clarify unclearness in any aspect of the course, then learners may not perform as expected. In the same context, if learners do not communicate with each other to provide support to each other and discuss intellectual topics in synchronous and asynchronous modes, then instructors' expectations will not be met nor students will master the content. In addition, if both learners and instructors have difficulties using the hardware and software necessary for interaction, then all their efforts will be consumed with how to figure out how to communicate with each other and little effort will be spent on the actual class content. All four types of interaction need to be present in a distance education course in order for the course to be successful. Research in this area would help educators define the set of skills needed to enhance interaction and satisfaction among distance education students.

Enhancing social presence in an online community should also be one of the first priorities of instructors and course designers. In order to do so, instructors should require online students to participate in asynchronous discussions about various topics of the course. Instructors should also provide immediate feedback to students' questions and assignments in order to help students feel that they are not alone in the class and that if they face a problem they have somebody to turn to.

In order to ensure easy access to course information, the course Internet address (URL) as well as the URL for the distance learning department homepage should be printed out in the published schedule of classes. Also, when students register for a course, they should provide updated personal information such as their current email address, telephone number, and postal address. This will ensure that students receive a registration packet with vital information.

Students who lack computer skills face major frustration and may drop the course because they cannot deal with technology. One way to prevent students from dropping out is to organize, possibly during an orientation week, a one-day technology meeting, during which students are taught how to use an email system, the Internet, and the conferencing system used in the course. Furthermore students should also be taught on how to submit online assignments. During the technical orientation meeting, students could create and post on the Internet their personal web page that includes a photograph and a short biography. This is a great way for classmates and instructor to put a face to the name. The meeting would be also useful for students to get to know each other and the instructor of the course.

In case students are not able to visit campus during the technology orientation meeting, the educational institution should provide technical support assistance via email or a toll free number. Online tutorials detailing the

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daily procedures of a course as well as describing how to use technology should also be developed. Institutions that created such a department and offer technical support twenty-four hours a day, seven days a week have lowered attrition rates that were due to technology problems. Some may argue that creating such a department will require a huge budget the university might not be willing to pay. However, funds for such a department might be available from the increased amount of students. Alternatively, institutions might charge students a small technology fee in order to overcome the cost barrier.

Providing a teaching assistant (TA) for instructors who teach web-based courses is another solution to help students stay enrolled in the course and succeed. The TA could be responsible for providing technical support to online students. Twenty students per TA is a reasonable number of students for such a task. One drawback to this solution is that the TA will not be available to provide immediate feedback twenty-four hours a day, seven days a week. Still, some technical assistance it is better than nothing.

In case none of the above is possible, course instructors should consider teaching students how to use technology during the first few weeks of the course. This might take away from the course content, but in the long run it will pay off. Students are less likely to drop the course and more likely to enjoy the content, and instructors will not be frustrated every time they receive a phone call or an email message from students who require help with technology.

Instructors should identify students who lack the ability to use online technologies in an online course and should provide early feedback. Students' perceptions of their skills with using technology can be measured using a self-efficacy questionnaire administered by the instructor at the beginning of an online course (Miltiadou, in press). The questionnaire can be posted on the Internet and students' answers could be collected either by email or using a database application. After analyzing results, instructors could warn students of their lack of skills with using technology and advise them accordingly. The provision of early feedback and remediation could result in students staying in the course. This may translate to a decrease in the high attrition rates evidenced in some online courses.

Instructional Design and Course Development Principles for Online Courses

The abundance of web-based courses that exist today does not guarantee that these courses are all instructionally sound. There are a number of design and development issues and principles that course developers need to consider in order to design high quality courses.

First, course developers need to answer some very basic questions such as (a) is the course content appropriate to be taught on the web? (Porter, 1997) (b) who is the target audience? (c) what are the course goals and objectives? (d) how will objectives be assessed? (e) what are the limitations of technology? Instructors who simply post lectures and assignments on the web are supplementing their course, but this would not usually constitute an instructionally sound course. Course developers should refer to instructional design models, procedures, and techniques and follow the necessary steps in order to ensure high quality courses (i.e. Dick & Carey, 1990; Gagne, Briggs, & Wager, 1992; Smith & Ragan, 1999). Several other good sources for advice regarding instructional design principles for distance learning include Eastmond and Ziegahn (1995), Hirumi and Bermudez (1996), Ritchie and Hoffman (1997), and Savenye (1999). Additionally Hannafin and his colleagues have developed guidelines for designing open-ended learning environments, which might form part of the distance learning course (Hannafin, Hall, Land, & Hill, 1994; Hannafin & Land, 1997).

In addition, instructional designers could follow Keller's (1987) Attention, Relevance, Confidence, and Satisfaction (ARCS) model in order to develop an intrinsically interesting course which would enhance students' motivation. Keller's (1987) ARCS model would be used to develop courses that would capture students' attention, enhance content relevance with their prior knowledge and experiences, built students' confidence, and enhance their satisfaction with instruction and content material.

Instructional designers should also make an effort to enhance the relevance of course contents with students' educational backgrounds and experiences. Incorporating case studies that approximate real life situations and match students' interests would increase students' learning goal orientation because it would capture students' attention and motivate them to learn. Instructors should not substitute the learning experience with easy assignments because students might lose interest (Locke, 1996; Locke & Latham, 1990). As a result, students' learning goal orientation might decrease, and it is learning goals that are responsible for students' mastery of the subject being taught.

Instructional designers should create well-planned and structured online courses, including syllabi that are clear and concise. Students should know exactly what is expected of them and the precise steps they need to follow

to accomplish the objectives of the course. Instructors thus would help students control their own pace for finishing assignments, posting messages to various discussion questions, and reading the required material. Johnston (1997), for instance, recommends developing an hyperlinked syllabus, providing students access to many other types of resources.

Course developers also need to either design their own interface, or use a web-course template provided by the distance learning department at their institution. Web page design is not a simple step and should not be taken lightly. The interface should be user-friendly, allowing for sufficient white space and consistent placement of text and images on each web page. A dark font size on white background should be used because often students print out web pages to be able to read the material easily. An appropriate font style and size, universal for both PC and Macintosh computers, is required for students to be able to read without difficulty. Colors should be subtle and should complement the content. Navigation should include a site map for easy access of all web pages by the students.

At the end of the design and development phases, course developers should post all necessary information on the class web page before the beginning of the semester. Such information should include the weekly schedule of readings, assignments, and discussion topics.

The issue of online exams is another major one in online courses. Often instructors feel that they do not have control over such examinations. One way to solve the problem is to have educational institutions collaborate on testing. For example, collaborating universities could provide the classroom and the exam proctors for students living in that area. Another idea is to have students submit essay-type questions, case studies, or research papers, on which it would be difficult for them to cheat.

A final instructional design consideration is the value of conducting formative evaluation and revision on the distance learning course and materials, as specified in most instructional design models. Porter (1997) in her chapter on determining whether courses are appropriate for distance delivery includes a useful checklist for evaluating distance learning courses. Another example of criteria to be considered in evaluating distance courses in schools is presented by Hawkes (1996).

Conclusion

Inquiry that sheds light on online students' motivational characteristics and organizational skills is vital in order to empower educators to design instructionally sound courses and students to benefit from them. Such research studies would aid academic administrators predict student success with the ultimate possible purpose of lowering attrition rates.

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